ment), is stored in a database DB. The DB can be simple as a file on filesystem or in any other suitable form, and it is required to persist over reboots and battery off situations. It can only write the DB to the filesystem upon powerdown of the mobile device, or write it at a large interval (e.g., once a day). Entries, per see, are very small, and by means of such a storage manner, it will consume quite small memory.

[0055] The entry can include, for example, cell_id, location area code, time_date_stamp and frame number. The "cell_id" denotes the GSM network Cell ID. The location area code denotes a code of location area wherein the cell is located. Since the frame number is specific to a base station, each cell will have its frame number. It is known that the Cell ID may be not unique across the network, and therefore the location area code can be introduced to ensure that the entry uniquely represents information for a cell. However, it should be appreciated that the entry can be any suitable structure, as long as it includes the frame number for a certain cell and the corresponding local time. For example, the cell_id can be designed to provide all information that is required for uniquely associating the frame number, and in such as case, the location area code can be omitted.

[0056] When the mobile device connects to a new cell, for example, it will check whether an entry for cell-id of the new cell exists. If not, an entry, including the cell_id, the frame number at that time and the corresponding timestamp on the mobile device, will be added into DB. If yes, it further determines whether the entry is valid or not.

[0057] If the entry is invalid, the entry is overwritten by a new entry including the cell_id, the frame number and the corresponding timestamp. If the entry is valid, it can calculate the time adjustment amount, i.e., the time difference between theoretical time and real time and adjust the time on the mobile device based on the time adjustment amount if the time adjustment amount is larger than the minimum adjustment threshold. Of course, it also can further make other determination as mentioned above, or any other suitable determinations.

[0058] An example of time adjustment amount calculation is given as bellows.

[0059] The entry saved in DB is as follows:

[0060] Cell_id=123, timestamp_1=1-Jul-2012_09:43:21:098, FN=2713552.

[0061] The current timestamp and corresponding frame number when cell_id later changes to the cell with a cell_id of 123 are:

[0062] timestamp_2=2-Jul-2012_17:47:22:867, FN=576767

[0063] The time difference is calculated as:

$$Time\_diff\_real=(timestamp\_2-\_timestamp\_1)=32\ h04\ m01\ s769\ ms=115441.769\ s$$

[0064] Based on the time difference, the theory frame number can be calculated as:

$$FN\_theory=(2713552+115441.769\ s/0.004615\ s)MOD\ 2715648=571540$$

[0065] Then in accordance with the current frame number and the calculated frame number, the time adjustment amount is calculated as:

$$FN\_delta=FN\_theory-FN\_real=571540-576767=-5227=-24.123\ s$$

[0066] In the above example, the calculated theory frame number, FN_theory, is a bit smaller FN_real and the time

adjustment amount is a negative value which means that the time on the mobile device is lagging a bit behind. So it can adjust the real time clock RTC in a forward direction by 24 seconds.

[0067] Reference is made to FIG. 4 to describe the apparatus as provided in the present invention. As illustrated in FIG. 4, apparatus 400 can comprise at least one processor 410; and at least one memory 420 including computer program code 430. Wherein, the at least one memory and the computer program code can be configured to, with the at least one processor, cause the apparatus to at least: determine a time adjustment amount based on at least a history frame number for a cell, a history timestamp corresponding to the history frame number, a current frame number for the cell, and a current timestamp corresponding to the current frame number; and adjust time based on the time adjustment amount.

[0068] Particularly, the determining a time adjustment amount can comprise determining a time difference based on the history timestamp and the current timestamp; determining a theory frame number based on the time difference and the history frame number; and calculating the time adjustment amount based on the theory frame number and the current frame number.

[0069] Before the local time is adjusted, it can first determine whether the time adjustment amount is larger than a minimum adjustment threshold. The time can be adjusted only if the time adjustment amount is larger than the minimum adjustment threshold. Preferably, the minimum adjustment threshold can be a function of difference between the history timestamp and the current timestamp. Additionally, it can further determine whether the time adjustment amount is lower than the maximum adjustment threshold, and the time can be adjusted if the result of the determination is positive.

[0070] In a case that the time adjustment amount is higher than the maximum adjustment threshold, it can provide an option to the user to ask whether a bigger time adjustment is allowed. And if it is allowed, the time is adjusted. In addition, it can also determine whether the user allows time adjustment under a ping_pong effect is allowed.

[0071] To avoid the ping-pong effect, it can also determine whether a frequency of time adjustment is lower than a predetermined frequency threshold or not. the time can be adjusted if a frequency of time adjustment is lower than the predetermined frequency threshold.

[0072] Besides, the apparatus can operate in a battery removal compensation mode. Thus, the time on the mobile device can be adjusted if the time adjustment amount indicates a forward time adjustment.

[0073] Additionally, the apparatus 400 can provide an setting option to control whether the automatic time adjustment is enabled. Thus, the apparatus 400 can be caused to perform the actions when the automatic time adjustment setting is enabled.

[0074] As mentioned hereinabove, the history timestamp and the history frame number can be obtained at one or more of when the mobile device is connected to a new cell; when the mobile device scans a base station; when a user of the mobile device adjusts the time manually; when a predetermined time is elapsed; when it detects a ping-pong effect; and when the history frame number for the cell is determined as invalid.

[0075] Next reference is made to FIG. 5 to describe another apparatus as provided in the present invention. As illustrated, apparatus 500 comprises means 510 for determining a time